

REMARKS

The Examiner is respectfully requested to enter the foregoing amendment prior to examination of the above-identified patent application.

The final Office Action dated June 2, 2005, included the following rejections to which the Applicants herein respond.

By this Amendment, claims 16-25 have been canceled, claims 26-31 have been amended, and new claims 33-45 have been added. Previously, claims 1-15 had been canceled. The Applicants respectfully submit that this Amendment does not present any additional claims without canceling a corresponding number of finally rejected claims. New independent claim 33 is based on original claim 16, and new independent claims 34-40 are based on claims 20-25, respectively. Support for the amendments to the claims and new claims 33-40 can be found on page 9, line 24 to page 11, line 13; page 15, lines 15-18; page 21, lines 20-22; page 29, line 22 to page 30, line 1; page 35, line 19 to page 38, line 10; and on page 30, line 14 to page 33, line 4 of the specification as originally filed. No new matter has been added. Claims 26-45 are pending and respectfully submitted for consideration.

Rejections Under 35 U.S.C. § 102

Claim 16 was rejected under 35 U.S.C. § 102(b) as being anticipated by Sakai (Japanese Patent Publication No. 03-248574). As noted above, claim 16 has been rewritten as claim 33. The Applicants respectfully submit that claim 33 recites subject matter that is neither disclosed nor suggested by Sakai.

Claim 33 recites an ion source for emitting an ion beam to the target surface of the substrate, and forming the pre-film of the crystalline silicon film on the target surface

of the substrate by the film forming device while emitting the ion beam to the target surface of the substrate from the ion source to form the pre-film having a crystallinity. The Applicants respectfully submit that there is no disclosure or suggestion of an ion source in Sakai. Sakai merely discloses that a polysilicon film 21 serving as the resistor film is formed by conducting laser annealing on the surface of the amorphous silicon film 14 using the excimer laser device 19 or the like to crystallize it. See page 6, lines 1-4 of the English translation of Sakai. As such, Sakai does not disclose or suggest the features of the invention as recited in claim 33.

Claims 17-19, 22, 23 and 31 were rejected under 35 U.S.C. § 102(e) as being anticipated by Asakawa et al. (U.S. Patent No. 5,795,385, "Asakawa"). Claim 17 has been rewritten as claim 34. Claims 18 and 19 have been canceled. Claims 22 and 23 have been rewritten as claims 37 and 38, respectively. Claim 31 depends from claim 33. The Applicants traverse the rejection and respectfully submit that claims 31, 34, 37, 38 recite subject matter that is neither disclosed nor suggested by Asakawa.

As a preliminary matter, the Applicants note that the Office Action set forth a rejection of claim 16 (now claim 33) in addition to the rejection of claims 17 (now 34)-19, 22 (now 37), 23 (now 38) and 31. See the paragraph beginning on page 3, line 17 of the Office Action.

With respect to claims 33, 34, 37 and 38, the Applicants submit that Asakawa does not disclose or suggest the claimed features of the invention. Claims 33, 34, 37 and 38 recite an energy beam irradiating device for irradiating said pre-film with an energy beam for crystallizing said pre-film, wherein the energy beam is selected from the group consisting of a laser beam and an electron beam. In contrast, Asakawa

discloses only a gas beam or a gas ion beam emitting device. Thus, the Applicants respectfully submit that Asakawa fails to disclose or suggest at least the feature of an energy beam irradiating device for irradiating said pre-film with an energy beam for crystallizing said pre-film, wherein the energy beam is selected from the group consisting of a laser beam and an electron beam, as recited in claims 33, 34, 37 and 38.

According to U.S. patent practice, a reference must teach every element of a claim in order to properly anticipate the claim under 35 U.S.C. §102. In addition, “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628,631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). “Every element of the claimed invention must be arranged as in the claim. . . . [t]he identical invention must be shown in as complete detail as is contained in the patent claim.” Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236 (Fed. Cir. 1989) (emphasis added). The Applicants respectfully submit that Sakai and Asakawa do not disclose or suggest at least the combination of features of the invention as recited in claims 33, 34, 37 and 38. Accordingly, Sakai and Asakawa do not anticipate claims 33, 34, 37 and 38 nor are claims 33, 34, 37 and 38 obvious in view of Sakai and Asakawa. As such, the Applicants submit that claims 33, 34, 37 and 38 are allowable over the cited references.

Rejections Under 35 U.S.C. § 103(a)

Claim 17 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Sakai and further in view of Fan et al. (U.S. Patent No. 4,309,225, "Fan"). As a preliminary matter, the Applicants respectfully point out that claim 17 (now claim 34) was rewritten in independent form in the previous Response filed January 18, 2005. Sakai was cited for disclosing many of the claimed elements of the invention with the exception of operating the energy beam irradiation device to irradiate the formed pre-film with the energy beam while moving the substrate in a second direction crossing the first direction. Fan was cited for curing this deficiency.

With respect to claim 34, the Applicants submit that the combination of Sakai and Fan fails to disclose or suggest the claimed features of the invention. The Office Action took the position that it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Sakai with Fan to obtain continuous, controlled motion of a crystallization front in an amorphous material. See page 6, lines 1-3 of the Office Action. However, the Applicants note that the Office Action did not provide a motivation for why one of ordinary skill in the art would modify the irradiation of the substrate in Sakai to move in a second direction crossing a first direction as recited in claim 34. Therefore, the Applicants respectfully submit that the combination of Sakai and Fan does not disclose or suggest the features of the invention as recited in claim 34.

Claims 20, 21 and 24-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Asakawa as applied to claim 17-19, 22, 23 and 31 above, and further in view of Selvakumar et al. (U.S. Patent No. 5,633,194, "Selvakumar"). Claims 20 and

21 have been rewritten as claims 35 and 36, respectively; claims 24 and 25 have been rewritten as claims 39 and 40, respectively; claim 26 depends from claim 33; claim 27 depends from claim 35; claims 28 and 29 depend from claim 37; and claim 30 depends from claim 36.

Asakawa was cited for disclosing many of the claimed elements of the invention with the exception of emitting the ion beam to the target surface of the substrate from the ion source prior to a step of forming the pre-film by the film forming device to form the pre-film which has a microcrystalline nucleus layer of silicon on a boundary with respect to the substrate in the step of forming the pre-film. Selvakumar was cited for curing this deficiency. The Applicants traverse the rejection and respectfully submit that claims 26-30, 35, 36, 39, and 40 recite subject matter that is neither disclosed nor suggested by the cited references.

Claims 35 and 36, as amended, recite an energy beam irradiating device for irradiating said pre-film with an energy beam for crystallizing said pre-film, wherein the energy beam is selected from the group consisting of a laser beam and an electron beam. In contrast, Asakawa discloses only a gas beam or a gas ion beam emitting device. As such, the Applicants respectfully submit that Asakawa does not disclose or suggest at least the feature of an energy beam irradiating device for irradiating said pre-film with an energy beam for crystallizing said pre-film, wherein the energy beam is selected from the group consisting of a laser beam and an electron beam. Thus, Asakawa fails to disclose or suggest the features of the invention as recited in claims 35 and 36.

Selvakumar fails to cure this deficiency in Asakawa with respect to claims 35 and 36, as Selvakumar also does not disclose or suggest at least the feature of an energy beam irradiating device for irradiating said pre-film with an energy beam for crystallizing said pre-film, wherein the energy beam is selected from the group consisting of a laser beam and an electron beam.

As noted above, claims 24 and 25 have been rewritten as claims 39 and 40, respectively. With respect to claims 39 and 40, the Applicants respectfully submit that the combination of Asakawa and Selvakumar fails to disclose or suggest the claimed features of the invention. Claims 39 and 40 recite that the ion beam is emitted to the target surface of said substrate from said ion source during a period from a stage before said pre-film forming step of forming said pre-film by said film forming device to an initial stage of said pre-film forming step to form the pre-film having a microcrystalline nucleus layer on a boundary with respect to the substrate. The Applicants note the Office Action's statement that "Asakawa et al. teaches all of the limitations of claim 21, as discussed previously in claim 17, an ion beam is emitted to the target surface of the substrate from the ion source prior to the step of forming the pre-film." See page 6, lines 7-9 of the Office Action. (With respect to claim 17, the Office Action took the position that "Asakawa et al discloses forming an amorphous silicon film on a substrate using plasma chemical vapor deposition, this reads on applicant's prefilm, while simultaneously irradiating the substrate with beams of low energy gas" See page 3, lines 4-6 of the Office Action).

The Applicants respectfully submit, however, that Asakawa does not disclose or suggest that an ion beam is emitted to the target surface of the substrate from the ion

source during a period from a stage before the pre-film forming step of forming the pre-film by the film forming device to an initial stage of the pre-film forming step to form the pre-film having a microcrystalline nucleus layer on a boundary with respect to the substrate, as recited in claims 39 and 40. There is no disclosure or suggestion in Asakawa of a pre-film of the crystalline silicon film, and thereby, no disclosure of suggestion of irradiation of a pre-film of the crystalline silicon film, as asserted in the Office Action.

The Applicants respectfully submit that Selvakumar does not cure the deficiencies in Asakawa with respect to claims 39 and 40. The Office Action proposed modifying Asakawa with Selvakumar to clean the substrate prior to the start of deposition. See page 6, lines 10-19 of the Office Action. The Applicants respectfully submit, however, that Selvakumar also does not disclose or suggest at least the feature of the ion beam being emitted to the target surface of the substrate from the ion source during a period from a stage before the pre-film forming step of forming the pre-film by the film forming device to an initial stage of the pre-film forming step to form the pre-film having a microcrystalline nucleus layer on a boundary with respect to the substrate. Therefore, it would not have been obvious to one of ordinary skill in the art to modify Asakawa, with the ion bombardment disclosed by Selvakumar, because to do so would not arrive at the claimed invention. Therefore, the teachings of Asakawa and Selvakumar are not sufficient to render the claims *prima facie* obvious.

Claim 32 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Asakawa as applied to claims 17-19, 22, 23 and 31 above, and further in view of Ahn et al. (U.S. Patent No. 5,470,619, "Ahn"). Asakawa was cited for disclosing many of the

claimed elements of the invention with the exception of plasma CVD using hydrogen gas. Ahn was cited for curing this deficiency. The Applicants traverse the rejection and respectfully submit that claim 32 recites subject matter that is neither disclosed nor suggested by the cited references.

Claim 32 depends from claim 33. The Applicants respectfully submit Ahn fails to cure the deficiencies in Asakawa with respect to claim 33 as Ahn fails to disclose or suggest an energy beam irradiating device for irradiating said pre-film with an energy beam for crystallizing said pre-film, wherein the energy beam is selected from the group consisting of a laser beam and an electron beam. Accordingly, the Applicants respectfully submit that as claim 32 depends from claim 33 and incorporates the patentable aspects thereof, claim 32 is therefore allowable for at least the same reasons as discussed above with respect to claim 33.

Under U.S. patent practice, the PTO has the burden under §103 to establish a *prima facie* case of obviousness. In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Both the case law of the Federal Circuit and the PTO itself have made clear that where a modification must be made to the prior art to reject or invalidate a claim under §103, there must be a showing of proper motivation to do so. The mere fact that a prior art reference could arguably be modified to meet the claim is insufficient to establish obviousness. The PTO can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. Id. In order to establish obviousness, there must be a suggestion or motivation in the reference to do so. See also In re Gordon, 221 USPQ 1125, 1127 (Fed. Cir. 1984)

(prior art could not be turned upside down without motivation to do so); In re Rouffet, 149 F.3d 1350 (Fed. Cir. 1998); In re Dembiczak, 175 F.3d 994 (Fed. Cir. 1999); In re Lee, 277 F.3d 1338 (Fed. Cir. 2002). The Office Action restates the advantages of the present invention to justify the combination of references. There is, however, nothing in the applied references to evidence these advantages or the desirability of these advantages in the disclosed structure.

In view of the above, the Applicants respectfully submit that the cited references do not support a *prima facie* case of obviousness for purposes of a rejection of claims 33-36, 39 and 40 under 35 U.S.C. §103.

Conclusion

Claims 26, 31 and 32 depend from claim 33; claim 41 depends from claim 34; claim 27 depends from claim 35; claim 42 depends from claim 36; claims 28 and 29 depend from claim 37; claims 43 and 44 depend from claim 38; claim 45 depends from claim 39; and claim 30 depends from claim 40. The Applicants respectfully submit that these dependent claims are allowable at least because of their dependency from allowable base claims 33-40. Accordingly, the Applicants respectfully request allowance of claims 26-45 and the prompt issuance of a Notice of Allowability.

Please charge any fee deficiency or credit any overpayment to counsel's Deposit
Account No. 01-2300, **referencing Attorney Dkt. No. 107351-00011.**

Respectfully submitted,



Rhonda L. Barton
Attorney for Applicants
Registration No. 47,271

Customer No. 004372

ARENT FOX PLLC

1050 Connecticut Avenue, N.W., Suite 400

Washington, D.C. 20036-5339

Tel: (202) 857-6000

Fax: (202) 638-4810

RLB/vdb/wbp

Enclosure: Petition for Extension of Time

(Three-months (difference between 2nd & 3rd months))